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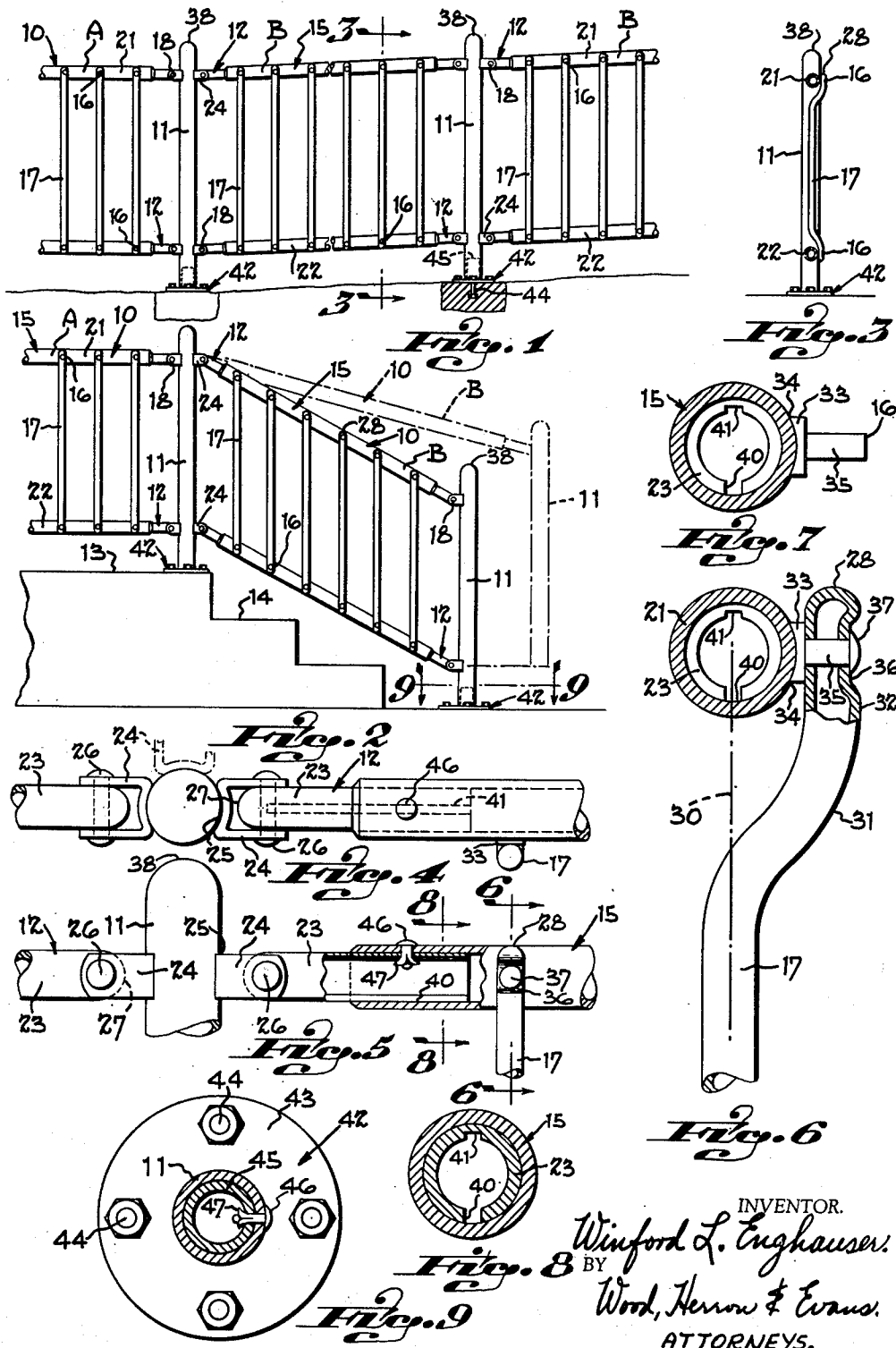
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INTERCHANGEABLE FENCE OR GUARD RAIL STRUCTURE

Filed Oct. 22, 1956

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

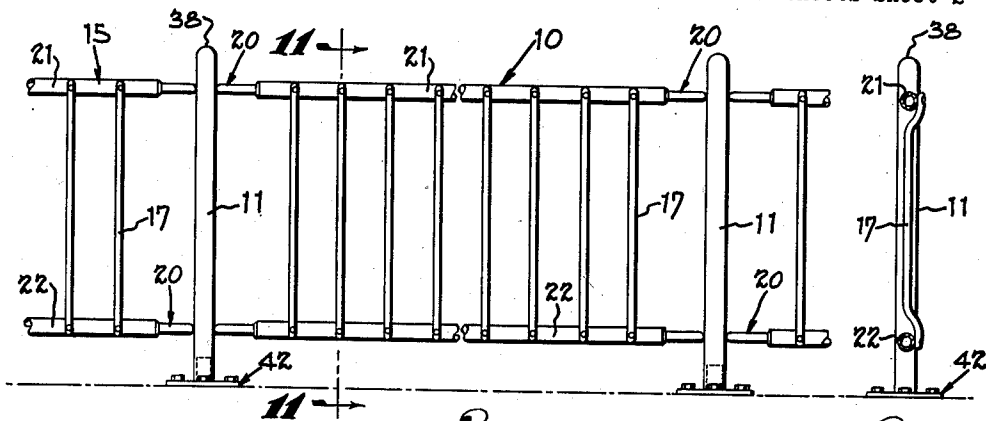


Fig. 10

Fig. 11

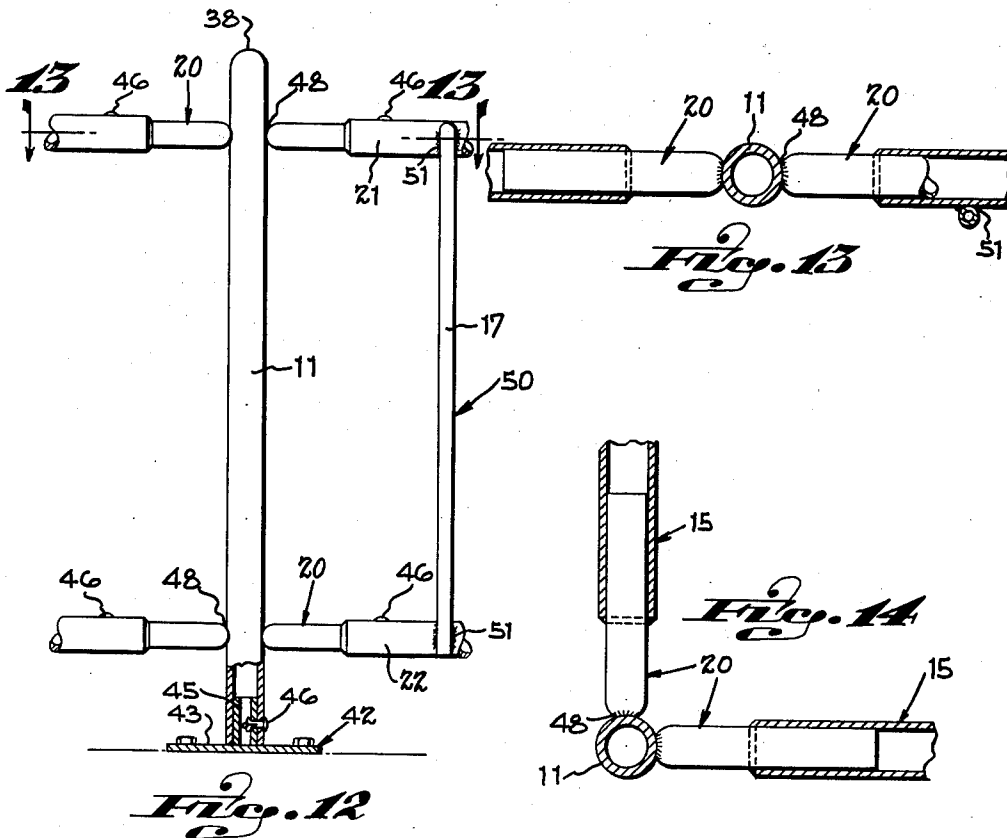


Fig. 12

Fig. 13

Fig. 14

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INTERCHANGEABLE FENCE OR GUARD RAIL STRUCTURE

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5 Claims. (Cl. 256—22)

This invention relates to prefabricated rail sections which are used interchangeably for fencing or for inclined guard rails for stairways and other sloping surfaces. A structure of this general character is disclosed in my prior Patent No. 2,687,283, which was issued on August 24, 1954.

In general, the present structure, as well as the one disclosed in my prior patent, comprises support posts and prefabricated rail sections, each section consisting of a pair of longitudinal stringers having spaced vertical palings pivotally connected to the stringers. The prefabricated rail sections preferably are mounted upon the posts after the posts are erected, the sections being free to articulate, thereby to correspond to the plane of the surface upon which the posts are set. In other words, when the rail sections are mounted upon posts at different levels, such as along a stairway, the sections are articulated in parallelogram fashion, that is, the longitudinal stringers occupy inclined planes, while the pickets or palings remain vertical, regardless of the inclination of the stringers. On the other hand, when the posts are set along a substantially level surface, then the rail sections occupy a horizontal position, while the palings retain their vertical relationship.

Briefly, the present invention contemplates the use of identical articulated rail sections with two different types of posts, both types of posts having connectors permanently attached to them and arranged to establish a detachable connection with the stringers. One type of post is provided with rigid connectors while the second type is provided with articulated connectors. When the rail sections are to be erected upon a level surface, then posts having rigid connectors are installed; when the sections are to be erected along a sloping surface, such as a stairway, posts having articulated connectors are installed.

The use of two different types of posts adapts the structure to practically any utility which requires a level or sloping rail section. For example, in a typical porch structure consisting of a level slab having steps leading up to it, posts are mounted upon the slab and along the stairway, and identical rail sections may be erected in level position upon the porch slab and in an inclined position alongside the porch steps. In this case, posts having articulated connectors may be used both on the slab and along the stairway. In this utility, the upper stringer forms an inclined hand rail of sturdy construction.

The posts having rigid connectors are intended primarily for mounting the sections in the form of level fencing. The rigid connectors are identical to the articulated ones; however, the rigid connectors are welded directly in right angular position to the posts and have the advantage of connecting the fence sections more rigidly and serve to strengthen the articulated sections. In the preferred form, the stringers and connectors are fabricated from pipe stock of an inexpensive commercial

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grade. The palings are also fabricated from tubular iron stock of a commercial grade.

One of the specific objectives of the invention has been to provide a structure similar in principle to that disclosed in the prior patent, but which is exceptionally inexpensive to fabricate and erect and which has a neat and trim appearance. In the present structure, the vertical palings are pivoted in a simple manner directly to the stringers; however, to locate the palings in a vertical plane common to the axes of the stringers, the opposite end portions of the palings have a curve which is partially S-shaped creating off-set portions which reside outwardly a distance equal to one-half the diameter of the stringers. When pivoted to the stringers, the off-set portions locate the palings in a plane which is common to the axes of the stringers between which they reside. To provide an obstructed hand rail for use of the section as a stair guard or the like, the upper ends of the palings terminate in a plane which is flush or below top surface of the upper stringer.

A further objective has been to provide an improved connector for joining the prefabricated sections to the posts (whether in level or inclined position) in a rapid convenient manner. For this purpose, each connector is in the form of a stud formed of pipe stock having a diameter adapting it to fit into the ends of the stringers. To facilitate the operation of joining the stringers into the connector studs, each stud has an open slot extending longitudinally, and its wall is grooved longitudinally on the side diametrically opposite the slot. The slot and groove allows the stud to compress as the stringer is slipped upon it, whereby the rail section conveniently is joined to the posts. The slot and groove construction also makes possible the use of commercial grade pipe stock without reaming or reworking the material such as usually is necessary because of the presence of scale or other surface projections which interfere with the telescopic fit of the parts.

According to the preferred form of the invention, the length of each prefabricated rail section is greater than the distance between the adjoining ends of the studs of a pair of posts. In mounting the section, one end is slipped telescopically upon the studs and its opposite end is then swung laterally into alignment with the studs of the second post and slipped upon them. Finally, the section is shifted bodily to a centralized position between the pair of posts and riveted to the studs.

In certain fence installations, on ground which has both level and sharply sloping areas, posts having rigid connector studs may be used in combination with posts having articulated studs. In this case, the palings assume an upright position both on the level stretches and also along the slopes to improve the overall appearance of the fencing.

The various advantages of the invention are more fully disclosed in the detailed description with reference to the drawings showing a preferred embodiment of the invention.

In the drawings:

Figure 1 is a fragmentary side elevation showing the railing sections erected in the form of fencing.

Figure 2 is a side elevation showing the articulated sections erected upon a porch slab and steps, showing the utility of the sections both as a guard rail for the slab and as an inclined hand rail along the steps.

Figure 3 is a sectional view taken along line 3—3 of Figure 1, showing generally the arrangement of the structure.

Figure 4 is an enlarged fragmentary top plan view, detailing the articulated connectors which join the rail sections to the posts.

Figure 5 is an enlarged fragmentary view projected from Figure 4, further detailing the articulated connector and the length adjustment which it provides.

Figure 6 is an enlarged sectional view taken along line 6—6 of Figure 5, detailing the pivotal connection of the palings to the stringer.

Figure 7 is an enlarged sectional view showing one of the rivets which pivotally connect the palings to the stringers. In this view, the rivet is shown in its blank form before formation of its head as is shown in Figure 6.

Figure 8 is a sectional view taken along line 8—8 of Figure 5, detailing the open slot and groove which imparts compressibility to the connector stud.

Figure 9 is an enlarged sectional view taken along line 9—9 of Figure 2, showing the connection of the post to its mounting socket.

Figure 10 is a view similar to Figure 1, but showing the interchangeable rail sections mounted on fence posts having rigid connectors.

Figure 11 is a sectional view taken along line 11—11 of Figure 10.

Figure 12 is a fragmentary sectional view showing a modified rail section mounted upon the structure shown in Figure 1.

Figure 13 is a sectional view taken along line 13—13 of Figure 12.

Figure 14 is a top plan view showing a corner post having rigid connectors.

Articulated structure

Referring to Figures 1 and 2, the rail sections, which are indicated generally at 10, are shown in level and inclined positions, conforming to the surface upon which they are mounted. Figure 1 shows a fence line which includes a sloping ground, the rail section indicated at A being mounted in level position and the sections B articulated to a sloping position. In this installation, the posts 11 are provided with articulated connectors indicated generally at 12. Figure 2 shows the rail sections mounted upon a porch slab 13, the section A forming a level guard rail extending around the slab and the section B being swivelled to an inclined position to serve as a stair rail along the steps 14 of the porch.

As explained later in detail, the rail sections are furnished to the user preferably in standard lengths; however, they may be cut to length in the field. In either event, they may be fitted to the posts after the posts are erected. It will be seen in Figures 1 and 2, that the longitudinal stringers indicated at 15, in combination with the posts 11, pivot or articulate as a parallelogram, depending upon the relative elevations of the posts to which the rail section is joined. It will be also noted that the pivot points 16 of the palings 17 are in alignment with the pivot points 18 of the connectors 12, such that the palings retain their vertical position regardless of the angular disposition of the longitudinal stringers.

As indicated in the second position in broken lines (Figure 2) the rail section 10 will accommodate itself to the slope of the stairway, depending entirely upon the relative elevations of the supporting posts. As explained later, in detail, minor variations in length are compensated by the telescopic connection of the stringers to the connectors 12. This makes it unnecessary to set the posts precisely at uniform centers in the field.

The erection of level or substantially level rail sections in the form of outdoor fencing, is illustrated in Figures 10—14. In this case, the rail sections 10 are mounted upon posts 11 which are provided with rigid connectors indicated generally at 20. The rigid connectors are welded directly to the posts in right angular position and support the rail sections in fixed level position. As explained later, the rigid connectors 20 telescopically interfit the stringers in the same manner as the articulated connectors 12. By virtue of this arrangement, the supplier has available a structure which meets practically all demands for indoor or outdoor rail or fence installations.

Described in detail with reference to Figures 1—9, each rail section 10 comprises an upper stringer 21 and a lower stringer 22 formed of commercial iron pipe stock of standard diameter. Each articulated connector 12 comprises a stud 23 (Figure 5) also formed of commercial pipe stock, having an outside diameter which slidably interfits the stringers. Each stud 23 is pivotally connected to the post by a U-shaped connector clip 24 permanently welded as at 25 to the post. The outer end of the stud fits between the limbs of the clip and is pivotally connected to it by a rivet 26. The outer end of the connector stud adjacent the rivet has a closed rounded end 27 which may be created by a swaging or spinning operation.

The spaced vertical palings 17 are also formed of commercial iron pipe or tube stock having a closed rounded end 28 similar to the connector studs. This protects the pivot bearings 16 from the weather; the lower ends of the palings may be left open since the lower pivots are not exposed to the weather.

The main intermediate portion of each paling is located in a vertical plane which passes through the centers of the stringers, as indicated by the broken line 30 in Figure 6. For this purpose, the opposite end portions of the palings are bent to a partially S-shaped curve 31 which blends into an off-set straight end 32 residing along one side of the stringers. The rivets 16 which pivotally connect the palings to the stringers, include mounting heads 33 welded directly as at 34 to the stringer, the rivets being spaced at equidistant points along the stringers. It will be noted that the upper and lower stringers are identical and that the rivets of the two stringers are located in vertical alignment with one another upon assembly of the rail section.

In its original form (Figure 7), each rivet 16 includes a straight shank 35 extending from its mounting head 33 and each end portion 32 of the paling has a bore which allows the paling to be slipped upon the rivet at assembly. Surrounding the bore, the end portion 32 includes a depressed flat 36 having an area greater than the bore which it surrounds. The shank 35 of the rivet is sufficiently long to project outwardly beyond the flat and the projecting shank is upset by a spinning operation to form the outer head 37 (Figure 6), permanently joining the paling to the stringer.

As shown in Figure 6, the rivet head 37 is substantially equal in diameter to the area of the flat 36 and the height of the head is equal to the depth of the flat, such that the head resides within the confines of the paling. It will be noted that the paling is in bearing engagement with the surface of the mounting head 33 which spaces the paling a slight distance outwardly from the stringer. The outer head 37 is in bearing engagement with the opposite side of the paling, thereby providing a strong pivotal connection.

In the preferred manufacturing process, the palings and stringers, after assembly are polished, then a chemical surface treatment to remove foreign materials; thereafter, a metallic, corrosive resistant film is deposited upon the prepared surfaces. After this treatment, one or more coats of suitable color finish is applied, thus providing an attractive, weather resistant structure.

The posts 11 for the articulated structure shown in Figures 1—9 are also formed of commercial iron pipe stock having a larger diameter than the stringer. The upper end of each post is closed as at 38, preferably by a spinning operation, as described above. The posts for the straight fence installation are provided with two sets of connector clips 24 welded on diametrically opposite sides as shown in Figure 4. The corner posts are also provided with two sets of clips, but in this case, the clips are mounted at right angles to one another as shown in broken lines in Figure 4. The parts which constitute the post assembly are also treated and finished as above noted.

As best shown in Figures 4 and 5, the diameter of the connector stud 23 is such that the stud fits snugly into the

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stringer 15. However, due to internal scale and other irregularities in the inside diameter of the stringer, each connector has an open longitudinal slot 40 extending nearly to its closed end 27. A diametrically opposed groove 41 is formed in the inside diameter of the stud coextensive of the slot 40. The groove has a depth somewhat greater than the wall thickness of the stud and delineates a flexible line which permits the stud to be compressed slightly. Accordingly, if any obstruction is encountered as the stringers are slipped in place, the connector is compressed as it passes the obstruction. Moreover, this compressibility allows the stringers to be sprung laterally as the rail section is slipped in place on the studs of a pair of posts.

The posts, whether mounted upon a porch structure or upon ground level, are supported upon mounting brackets as indicated generally at 42 in Figures 1 and 2, the brackets being interchangeable in use. Each bracket comprises a circular base plate 43 (Figure 9) having mounting holes to receive a series of anchor bolts 44. The anchor bolts are set in concrete as indicated in Figure 1, which is poured into mounting holes dug in the ground, or as in Figure 2, they are set in the concrete porch structure at the time of pouring. The base plate is secured in position by nuts threaded on the anchor bolts. Each base plate includes a vertical stud 45 centrally located and welded upon the plate. The stud slidably interfits the lower open end of the post and may be slotted and grooved to provide compressibility as described above. After the posts are slipped upon the studs, a hole is drilled through the pipe and stud, then a self-expanding rivet 46 is driven in, as explained with reference to the connector studs.

The prefabricated rail sections 10 preferably are furnished to the user in a series of standard lengths, such that by selection of the proper length, a given job may be completed with little or no cutting. For erection of fencing, the maximum length preferably is utilized. In this case, the fence posts are located at uniform spacing, such that the connector studs are spaced to receive the opposite ends of the stringers. Preferably, the stringers are slipped upon the studs of one post, then the section is swung laterally to align the opposite ends of the stringers with the studs of the second post. The rail section is then shifted lengthwise to telescopically engage the stringer upon the second set of studs and to locate the section in a centralized position between the posts. In this position, the opposed connector studs project for approximately one-half their length into the opposite ends of the stringers as shown in Figure 5. Thereafter, holes are drilled through the wall of the stringers and through the connector studs and a rivet 46 of the self-expanding type (Figure 5) is driven into each hole to secure parts rigidly together. The holes may be located at the upper surface of the stringer opposite to the open slot of the connector, as shown, or they may be located at the side. The rivets 46 are commercially available and are not disclosed in detail. The preferred rivet includes a head and a cylindrical shank which is bored axially to the head. An expansion plug has its outer end projecting beyond the head and is arranged to expand the inner portion 47 of the rivet upon being driven forcibly into the rivet, flush with the head.

Rigid structure

In the modified structure shown in Figures 10 to 14, the rail section 10 is identical to the one described above, except that the clips 24 are eliminated. As noted earlier, the rounded ends of the rigid connector studs 20 are welded directly to the posts as at 48, the studs being at right angles to the post. For the straight fence sections, two sets of connector studs project from diametrically opposite sides of the pipe (Figure 13), and for the corner posts, the studs project at right angles as shown in Figure

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14. The connectors of each set naturally are located to match the upper and lower stringers 21 and 22.

In erecting the rigid fence sections, the posts are first mounted in brackets 42 similar to that described above and the posts are riveted in position. The rigid connector studs are provided with an open slot 40 and groove 41 similar to the articulated studs. The rigid studs may be slightly shorter than the articulated ones since the sections are mounted on level surfaces and require less telescoping adjustment than the articulated sections which adapt themselves to level or sloping surfaces. After the posts are erected, the stringers of the fence sections are joined and riveted to the studs as described above. Although this structure is intended for installation upon level or nearly level ground, the rigid studs provide sufficient looseness to accommodate slight changes in grade.

As an alternative to the articulated fence sections shown in Figure 10, a welded structure, indicated generally at 50 (Figure 12) may be installed upon the rigid connector studs. The welded rail section is similar in appearance to the articulated section, except that the rivets 16 are omitted. Instead, the palings 17 are spot welded as at 51 directly to the stringers (Figure 13). This structure is installed in the manner described above and may be used in combination with the articulated sections for level and sloping grades. The rigid sections preferably have their pickets located at slightly less spacing than the articulated sections. Accordingly, palings of the articulated sections, upon being adjusted to an inclined position, move toward one another to closer centers, corresponding to those of the horizontal rigid sections of the combination.

Having described my invention, I claim:

1. A rail section comprising, a pair of spaced vertical posts, a pair of connector studs for each post, each connector stud comprising a tube having an open slot extending longitudinally thereof, the wall of said tube opposite the open slot having a groove extending longitudinally thereof, said groove substantially reducing the wall thickness of the tube and imparting compressibility to the stud, said studs being spaced apart from one another and having end portions joined to said posts, said studs projecting angularly from said pair of posts toward one another and in axial alignment with one another, a pair of parallel stringers extending longitudinally between said posts and having a length less than the space between the posts, said stringers having tubular end portions telescopically interfitting said connector studs, a plurality of palings each having partially S-shaped opposite end portions offset outwardly, said off-set opposite end portions joined to the stringers along one side thereof, said off-set end portions locating the palings in a common plane which passes through the axes of the stringers, and attachment means on said stringers engaging said studs and locking the stringers to the studs in a selected longitudinal position between the posts.

2. An articulated rail section arranged to be erected selectively in a horizontal or inclined position comprising, a pair of spaced vertical posts, a pair of connector studs for each post, pivot means connecting each pair of studs to a respective post, said pairs of studs residing in a common plane passing through the axes of said posts and projecting angularly from the posts toward one another, a pair of parallel stringers having a length less than the spacing of said pair of posts, said stringers extending longitudinally between said posts and having opposite tubular end portions telescopically engaging said connector studs, means securing the tubular end portions of the stringers to the studs in a selected longitudinal position between the posts, a plurality of vertical palings, each of said palings having off-set outer end portions residing along one side of the stringers and having an intermediate portion residing in a common plane which passes through the axes of the stringers and posts, pivot means connecting the off-set portions of the palings to the stringers, the

pivot means of said connector studs and palings being located in common longitudinal planes, said stringers being articulated in parallelogram fashion to a plane determined by the elevations of said vertical posts and said palings thereby being maintained in vertical position independently of the plane of the stringers.

3. An articulated rail section arranged to be erected selectively in a horizontal or inclined position comprising, a pair of spaced vertical posts, a pair of connector clips on each post, each connector clip including a pair of spaced limbs residing side by side in a horizontal plane, each pair of limbs residing in vertical alignment with one another along the post, the pairs of limbs of each post located at corresponding vertical spacing and projecting toward one another from the respective posts, a respective connector stud for each pair of limbs, said studs residing in a common plane passing through the axes of the posts, each stud having an endwise portion disposed between said limbs, pivot means connecting the studs to the limbs for arcuate motion of the stud in a vertical plane, each of said studs comprising a tube having an open slot extending longitudinally thereof, the wall of each tube opposite said open slot having a groove extending longitudinally thereof, said groove substantially reducing the wall thickness of the tube and imparting compressibility to said studs, a pair of parallel stringers extending longitudinally between said posts, said stringers having a length less than the space between the projecting ends of said limbs, each stringer having a tubular end portion telescopically interfitting said studs, whereby the studs connect said stringers to the posts, a series of vertical palings having opposite end portions off-set outwardly and residing along one side of the pair of stringers, respective pivot means connecting the off-set portions of the palings to the stringers, said palings having intermediate straight portions residing in a common plane which passes through the axes of the stringers and posts, the pivot means of the connector studs and palings being located along common planes, said stringers being articulated in parallelogram fashion to a plane determined by the relative elevations of said posts and maintaining said palings in vertical position independently of the longitudinal angle of the stringers.

4. An articulated rail section arranged to be erected selectively in a horizontal or inclined position comprising, a pair of spaced vertical posts, a pair of connector clips spaced apart from one another and secured to each of said posts at equal spacing, said clips projecting toward one another from said posts, a respective connector stud having an end portion pivotally joined to each connector clip, said studs projecting toward one another from the respective posts and residing in a common plane passing through the axes of the posts, a pair of parallel stringers formed of tubular material and extending longitudinally between said posts, said stringers having opposite end

portions telescopically engaging said studs and being shiftable longitudinally between the posts, attachment means securing the end portions of the stringers to the studs in a selected longitudinal position, a plurality of pivot elements spaced apart along said stringers and projecting outwardly along the sides thereof, the pivot pins of the two stringers residing in vertical alignment with one another, a plurality of vertical palings each having opposite end portions off-set outwardly, said pivot pins passing through said off-set portions and pivotally joining the palings to the stringers, the intermediate portions of said palings residing in a common plane which passes through the axes of the stringers and posts, the pivot means of the connector studs and pivot pins of the palings being located in common longitudinal planes, whereby the stringers are articulated in parallelogram fashion in angular relation to the posts as determined by the relative elevation of said pair of posts and said palings reside in vertical position independently of the angular disposition of the stringers.

5. A rail section comprising, a pair of spaced vertical posts, each post having a pair of connector studs, each connector stud comprising, a tube having an open slot extending longitudinally thereof, the wall of said tube opposite the open slot having a groove extending longitudinally thereof, said groove substantially reducing the wall thickness of the tube and imparting compressibility to the stud, the studs of each pair being spaced apart from one another and each pair having one rounded end which is butt welded to said posts, said studs projecting from said pair of posts toward one another in axial alignment with one another in a plane which passes through the axes of the posts, a pair of parallel stringers extending longitudinally between said posts, said stringers having tubular end portions telescopically interfitting said connector studs, a plurality of palings, each of said palings having a partially S-shaped endwise portion providing outwardly off-set opposite ends, said opposite ends being joined to the stringers along one side thereof, said palings having intermediate straight portions joining said partially S-shaped curved portions, said straight portions residing in a common plane which passes through the axes of the stringers and posts, said stringers being shiftable longitudinally along said studs to a selected position between said posts, and attachment means on said stringers engaging said studs and locking the stringers to the studs in said selected longitudinal position between the posts.

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